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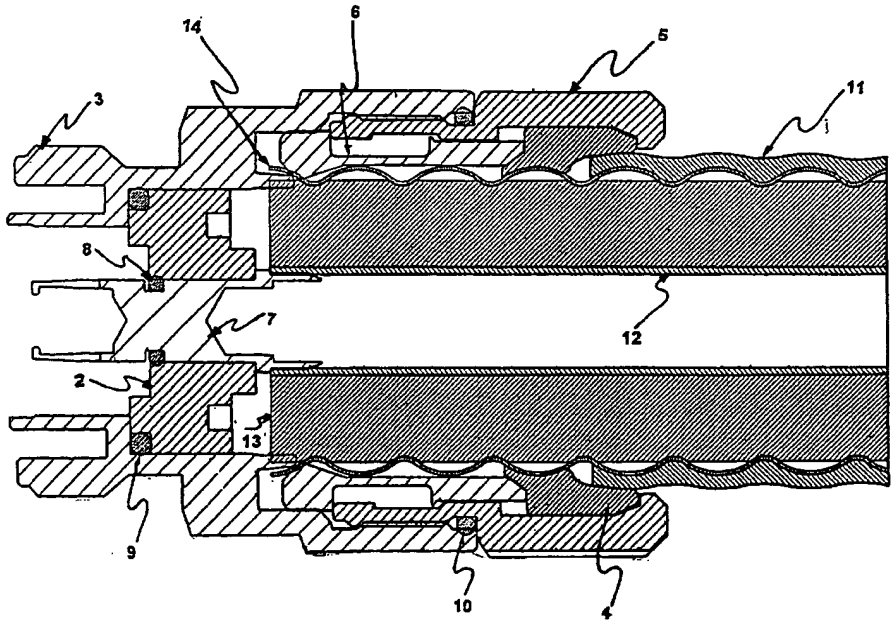
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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: DOUBLE SEAL FOR COAXIAL CONNECTOR DEVICES



(57) Abstract: A coaxial connector device including an outerconductor front part (3), a moveable backnut (5), a ferrule (6) and a backseal (4) at its cable receiving end where said backseal (4) forms a hermetic seal around both the cable jacket (11) and the outerconductor (14) when in its closed position.

WO 2004/055943 A1

DOUBLE SEAL FOR COAXIAL CONNECTOR DEVICES

TECHNICAL FIELD

The present invention relates generally to a connector for cables or more particularly to a moisture-inhibiting sealing system for connectors which accommodates cables.

BACKGROUND OF THE INVENTION

Current connectors on the market are susceptible to moisture leaking into the device and interfering with the conductivity of the contacts, resulting in a poor connection between the contact device and cable. Current methods use either a system of O-rings or injected silicone-based sealing products to seal the various joints. However, current connectors are prone to leakage of moisture running along the cable and thus entering the internal workings of the connector and interfering with its performance.

U.S. Patent No. 6,133,532 attempts to solve this problem by the aid of an O-ring seal between the cable jacket and the backnut portion of the connector. However, this method has many drawbacks which may lead to the leakage of moisture into the device. The failure of the O-ring is mainly due to the small area of contact with the cable jacket which means that any small amount of degradation of the O-ring or damage to the jacket surface, e.g. scratch, could result in a leakage of moisture.

SUMMARY OF THE INVENTION

The object of the present invention is to eliminate the problems and drawbacks in connection with the use of O-rings in sealings between the cable and connector device with regard to the leakage of moisture into the device.

The invention solves these problems by introducing a sealing means which forms a hermetic seal with both the cable jacket and the exposed cable outerconductor, in

effect giving a hermetic double seal. The sealing means is formed such that large areas, compared to O-ring methods, are in contact with the surfaces to be sealed resulting in a substantially larger barrier for moisture to penetrate, which also covers any physical defects in the cable.

In an open state, the backnut is screwed forward which allows the cable to be inserted freely. When the backnut is screwed backwards to the closed position, the sealing means is sandwiched between the inserted cable and tightened backnut with an additional lateral force applied by the ferrule, thus forming a hermetic seal between the backnut and inserted cable.

A further object of the invention is to provide a more secure gripping means for the cable. This too is achieved by the substantially larger cable area which comes into contact with the sealing means.

BRIEF DESCRIPTION OF THE DRAWING

Figure 1 is a longitudinal cross-section of the connector in its open position, and Figure 2 is a longitudinal cross-section of the connector in its closed position.

DETAILED DESCRIPTION OF THE INVENTION

Figure 1 illustrates an embodiment of a connector according to the invention in its open state, which enables a cable to be moved freely within the connector. When the cable is fully inserted, the innerconductor 12 of the cable comes into contact with the innerconductor 7 of the connector which is located in the centre of the insulator 2 which in turn is positioned in the centre of the outerconductor front part 3. The connections between each part include a seal of some sort which is substantially hermetic and which in this embodiment takes the form of O-rings 8 and 9, respectively. These parts are rigidly connected to each other and remain static throughout the opening and closing procedures.

In its open state the backnut 5 is fully extended allowing enough room for the cable to pass freely between the backseal 4 and ferrule 6.

Figure 2 illustrates the connector in its closed state where the foam 13 of the cable abuts the inner rim of the outerconductor front part 3 and the outerconductor 14 of the cable is in contact with and pressed between the ferrule 6 and the rim of said outerconductor front part 3. This is due to the backnut 5 being tightened until it is in its closed position. This also forces the backseal 4 to clamp onto and secure itself around the exposed outer conductor 14, while its front end engages and presses against the cable jacket 11. Thus, together with the O-ring 10, which forms the seal between the outer rim of the outer conductor front part 3 and the backnut 5, the cable insertion end is sealed.

One embodiment of the invention is particularly suited for a cable with a corrugated outerconductor, where the backseal 4 is stepped with an thin outer portion and thicker inner portion. When the backnut 5 is in the closed position, the backseal 4 is brought into contact with the ferrule 6 which applies a lateral pressure to it as well as ensuring a contact between the cable outerconductor 14 and the outerconductor front part 3. The backnut 5 has a lip at its outer edge, which also exerts a lateral pressure on the backseal 4; thus the backseal 4 is effectively sandwiched between the two and prevented from lateral movement. In this embodiment, the outer portion of the backseal 4 seals around the cable jacket 11 and the inner portion is moulded and seals around a corrugation in the outerconductor 14 of the corrugated cable.

Although the double seal according to the invention has been described above in connection with a cable comprising a corrugated outerconductor, it is understood that it can also be used in connectors adapted for cables with a non-corrugated outerconductor.

In another embodiment, the back seal 4 is a ring of flexible, durable and waterproof material (for example a silicone or rubber based material or thermoplastic such as TPE) which has a certain outer diameter and two inner diameters giving a stepped effect.

In yet another embodiment, the back seal is also a ring of flexible, durable and waterproof material with a certain outer diameter and having two different diameters at its opposing ends with the inner diameter tapering from the larger end diameter to the smaller. As described above, the function of the differing diameters is to accommodate the cable jacket 11 within the larger diameter and the cable outer conductor 14 within the smaller diameter.

CLAIMS

1. A coaxial connector device, comprising an outerconductor front part (3), a moveable backnut (5), a ferrule (6) and a backseal (4) at its cable receiving end, characterised in that said backseal (4) forms a hermetic seal around both the cable jacket (11) and outerconductor (14) when the backnut (5) is tightened.

2. Connector device according to claim 1, characterised in that the cable is a corrugated cable.

3. Connector device according to claim 1, characterised in that the cable is a non-corrugated cable.

4. Connector device according to claim 1, characterised in that the cable outerconductor 14 is in contact with both the outerconductor front part (3) and the ferrule (6).

5. Connector device according to claim 1, characterised in that the backseal (4) has at least two different inner radii.

6. Connector device according to claims 1, 4, 5 and either 2 or 3, characterised in that the backseal (4) is made of a silicone based material

7. Connector device according to claims 1, 4, 5 and either 2 or 3, characterised in that the backseal (4) is made of a rubber based material.

8. Connector device according to claims 1, 4, 5 and either 2 or 3, characterised in that the backseal (4) is made of a thermoplastic.

FIGURE 1

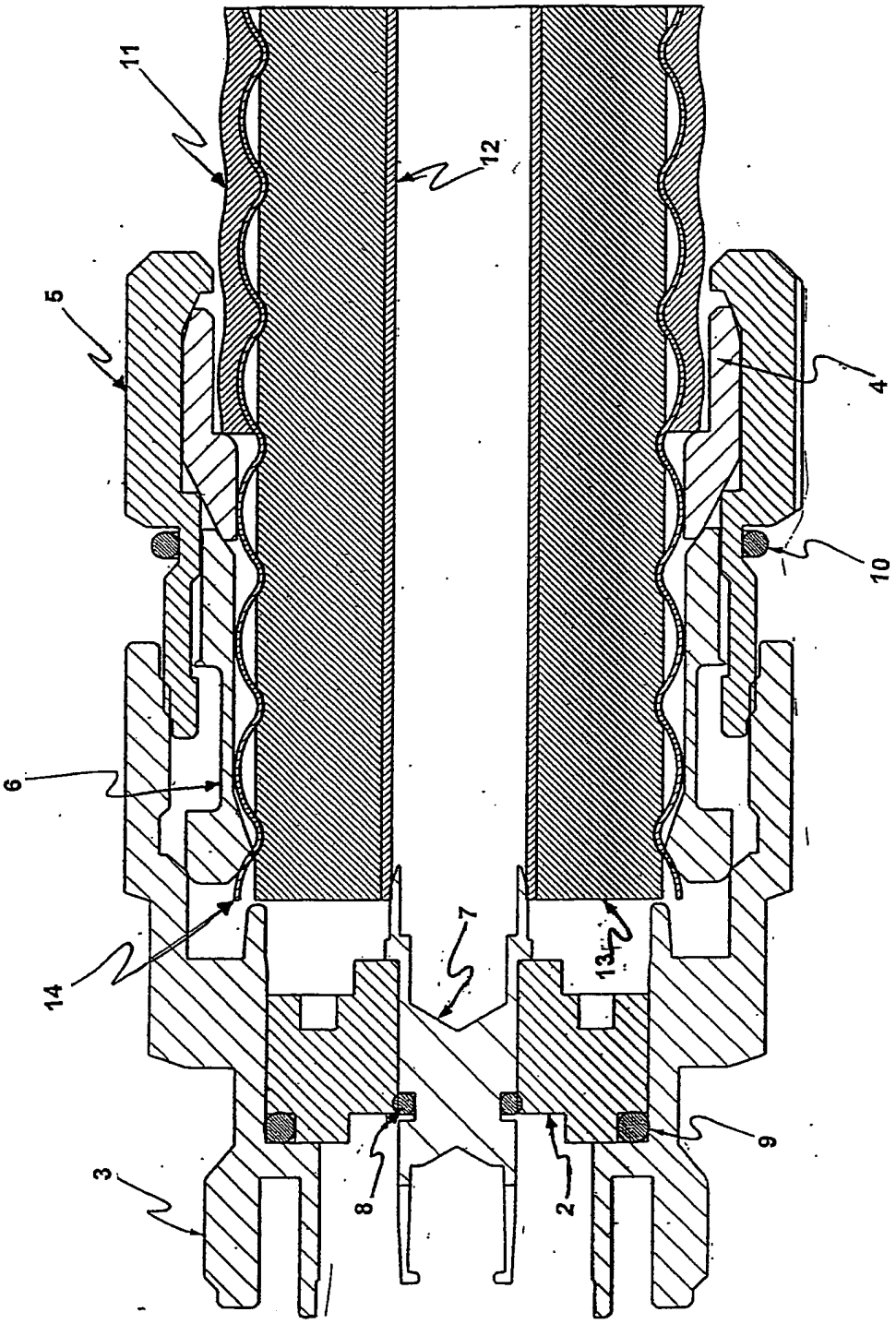
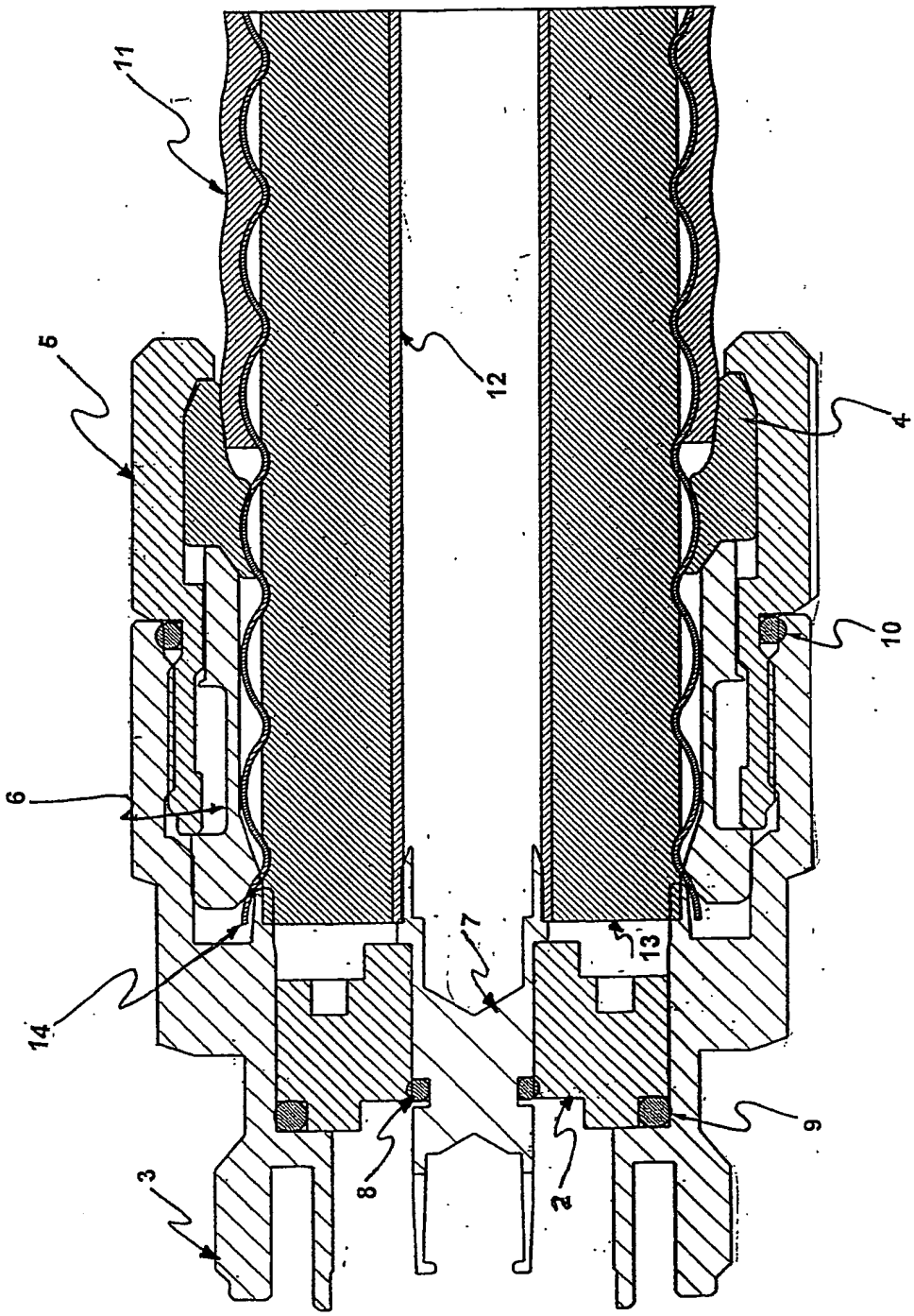


FIGURE 2



INTERNATIONAL SEARCH REPORT

national Application No
PCT/DK 02/00870

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H01R9/05 H01R13/52

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H01R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 080 015 A (ANDREESCU PAUL) 27 June 2000 (2000-06-27) column 4, line 5 - line 31 column 5, line 42 - line 44 figures 4,5	1-8
A	US 6 332 808 B1 (MATSUDA NOBUYOSHI ET AL) 25 December 2001 (2001-12-25) column 3, line 54 -column 5, line 29; figures 2,8	1-8
A	US 5 951 327 A (MARIK GREG) 14 September 1999 (1999-09-14) column 4, line 29 -column 5, line 41; figures 2-5	1-8

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
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Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	KERSTIN WACZINSKA/MN

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INTERNATIONAL SEARCH REPORT

Information on patent family members

National Application No
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